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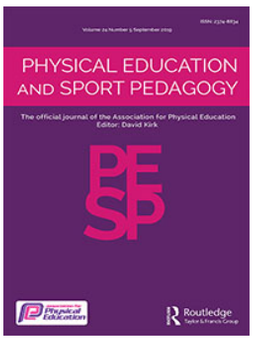

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Exploring students' perceptions of video-guided debates in a game-based basketball setting

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ABSTRACT

Background: Digital video has been increasingly adopted as a pedagogical tool in physical education. One implementation is in teaching students' tactical understanding in games, in which it can promote students' perceptions and shared understanding in learning tactical situations within a game-based approach.

Purpose: The central aim of this study was to explore how mutual agreement and accuracy of students' perceptions of tactical aspects of a basketball game situation and students' perceived learning outcomes are influenced by using a debate of ideas (DI) setting that is enriched with video footage from digital tagging the foregoing game play.

Participants and setting: Two groups of secondary school students (N = 20, 11–13 years) judged the tactical appropriateness of 'shooting at the basket' in modified basketball games during three lessons. In-between two matches, a debate of ideas session was organized. One group of students introduced video-tagged video-clips into the debate, while the second group debated without video-clips. Students' mutual agreements in identifying and judging a shot on basket was assessed, as well as the accuracy of students' judgements of shots during the games. In addition, students' perceived learning outcomes were determined after each lesson.

Findings: The results of the study revealed for both groups relatively low percentages of agreement among students with respect to identifying and judging a shot on basket. This shows that students perceived the situations that were debated differently. Similarly, both groups showed low accuracy in their judgements regarding the appropriateness of the shot. No group differences were revealed. However, students of the video-guided group had increased shared understanding regarding their perceived learning outcomes in comparison to students that debated without video.

Conclusion: The debate of ideas in a pedagogical game-setting generated a variety of meanings about tactical situations among students, which were weakly dependent of the debate being enriched by digital video. Student-centered debates supplemented with video-clips can support teachers in promoting students' shared understanding of tactical learning objectives of games.

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TGfU; digital observation; tagging; debate of ideas; video feedback

Introduction

In physical education (PE), an important pedagogical tool for teachers for developing students' tactical understanding in games is to ask questions and stimulate discussions (Gréhaigne, Godbout, and

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Bouthier 2001; Harvey and Light 2015). Questions and discussions invite students to become aware of the importance of the dynamics of the game (e.g. the changes in players' relative positions on the field) and for deciding about (appropriate) actions, while also increasing students' active involvement and engagement in games (Harvey, Cope, and Jones 2016). Accordingly, research has shown that asking questions and stimulating discussions about strategies and intentions during time-outs appeals to students' tactical thinking (Almond 2015; Light and Fawns 2003; Richard and Wallian 2005).

However, there is a dearth of research addressing what students actually think and discuss during questioning and discussions. This is pertinent because it is not unlikely that students are not always in agreement (i.e. either implicitly or explicitly) about what situation is discussed. For example, in basketball games, whether or not a certain position at court affords shooting at the basket not only depends on the distance to the basket, but also on the student's throwing capabilities. For example, a skilled student would consider an undefended position from a far distance as an opportunity for shooting, while a less skilled student needs to be significantly closer to the basket before throwing is afforded. Given these individual differences, it cannot be presumed that students' perceptions and understanding of the situation of interest are identical. Consequently, posing questions and stimulating discussion may not inevitably lead to a rich learning environment. SueSee, Pill, and Edwards (2016) noted that

> … it is a combination of the question and the knowledge which student does or does not possess before the question is asked. It is this difference in knowledge between learners which makes it difficult to determine if all learners are discovering new knowledge and whether everyone or anyone is discovering at all. (81)

In fact, if students perceive different situations or perceive situations differently, then this may also increase the differences (and/or misunderstandings) in what appropriate tactical decisions are.

One prominent example of stimulating discussions is creating a 'debate of ideas' (DI), in which students discuss strategies and exchange tactical ideas in-between play (Gréhaigne, Godbout, and Bouthier 2001; Gréhaigne, Richard, and Griffin 2005; Mitchell, Oslin, and Griffin 2013; Storey and Butler 2010). Proponents of DI have argued that a debate can foster students' tactical understanding and decision-making (e.g. Chang et al. 2006; Darnis and Lafont 2015). With the DI, Gréhaigne, Godbout, and Bouthier (2001, 2005) aimed to develop a setting that matches with a pedagogy that centralizes social interactions between students in the learning process. Through these interactions, students themselves discover fitting tactical solutions instead of the teacher prescribing the optimal solution. Since a particular game situation affords different solutions for individual students and because they differ in action capabilities (i.e. their ability to achieve meaningful action outcomes), there is no one optimal solution or strategic decision for the teacher to be taught. DI can bring these differences in students' perception to the fore and fosters the exchange of tactical solutions by promoting interactive discussions. DI is grounded in the students' perceptions of game play. It typically unfolds through a series of didactical steps: observing and describing the relevant situations in the game (Richard and Wallian 2005), identifying and interpreting the tactical problems of the situation (e.g. Wright and Forrest 2007), and verbalizing the tactical strategies for the situation (e.g. Zerai 2018). Finally, after the debate, students try to bring the newly formulated tactical intention and strategies into practice with the resumption of game play. Experiences during game play will feed into the next debate, and so on.

DI is consistent with social constructivist learning methods in which the teacher facilitates learning in groups (Richard and Wallian 2005). The social context of a DI fosters students' learning and skills in perceiving what game situations afford and stimulates students' autonomy in making choices (Harvey and Light 2015). Organizing DI provides PE teachers many opportunities before, after or in-between game play for promoting discussions and interactions on tactical issues; yet, the unfolding of these sessions has largely remained unclear. For instance, researchers have not often addressed how students (mutually) influence each other's perceptions and performances during game play following a debate. In one study, Koekoek and Knoppers (2015) examined 13-year-old students' perceptions of

how they learned in a modified baseball game, based on principles from Teaching Games for Understanding (TGfU). They suggested that social interactions, particularly regarding collaboration and communication, may also adversely influence learning. Classmates, who worked together in groups, sometimes had negative ideas of their peers, which resulted in ineffective collaboration and/or negative thoughts about others' performances. Although the study of Koekoek and Knoppers (2015) did not specifically focus on DI, it underlines the presence and impact of differences in students' perceptions. In DI, differences in students' perceptions likely influence students' agreements and may even lead to confusion of what a situation affords and what decisions are appropriate. Nonetheless, differences in perception may also introduce new situational perspectives on the tactical situation into the debate. It is pertinent to establish the impact of differences in students' perceptions, because it can inform teachers whether they should try to reduce or encourage them. In other words, the effective implementation of a DI warrants that the necessary conditions for a pedagogical debate are addressed (e.g. Light 2013). Hence, the current study addresses the mutual agreement and the accuracy of students' perceptions of the shot on the basket within the context of a DI setting.

Digital video and debates in game-based settings

A didactical tool that may support the mutual agreement and accuracy of students' perceptions during DI is reviewing video footage from students' actual game play. In general, researchers have claimed beneficial effects of digital video in PE and sports, especially when used for video-modeling (Amara et al. 2015; Sani and Khan 2017) and assessment for learning such as feedback (O'Loughlin, Chróinín, and O'Grady 2013; Kok and van der Kamp 2018; Palao et al. 2015; Van der Kamp et al. 2015; Weir and Connor 2009). This research has largely focused on supporting the learning of motor skills or techniques, and only few studies have investigated digital video to enhance game understanding (e.g. Blomqvist, Luhtanen, and Laakso 2001; Ningthoujam 2016).

Video-based analysis can be a useful teaching strategy within game-based approaches to enhance game understanding, because it creates a student-centered PE learning situation. Yousef, Chatti, and Schroeder (2014) argued that in a student-centered learning setting digital video can provide '… space for students to be active participants in their learning environment, interact to build and construct knowledge, and get mutual support to make decisions using reflection and critical judgement' (115). Nevertheless, studies that have examined the effects of digital video in student-centered learning settings are scarce (Gainsburg 2009; Smyth 2011). An exception is the study by Harvey and Gittins (2014) that compared two groups of 13–14 years old students involved in DI with and without video-based tactical feedback. Video footage of game play was recorded and selected by the researchers, who also planned and controlled when the footage was fed into the student discussions. It was found that students' game performances (e.g. conquering and receiving balls, successful shots) significantly improved in students who participated in the DI with video feedback compared to those who discussed without video footage. Harvey and Gittins (2014) argued that looking back on game situations may increase the agreement of students' perceptions, and thus make questioning and discussions more effective. However, the study did neither assess the agreement between students' perceptions nor report the accuracy of their perceptions. It did not examine either what students thought they had learned from the discussions. Finally, although the students in Harvey and Gittins' study participated in the discussions, the DI sessions were not fully student-centered. A student-centered DI means that it would allow the student to control input of video footage, rather than having it provided by the researcher (or teacher).

In this respect, recent developments in PE regarding digital video-tagging allow students to record and select game situations of interest (Koekoek, Walinga, and van Hilvoorde 2017; Koekoek et al. 2018). Video-tagging is an annotation tool (Rich and Hannafin 2009) that can be used in PE settings for observational purposes in which events are marked during 'real time' video recording (Koekoek et al. 2018). If students do the video-tagging, they can learn to recognize key events during game play. Moreover, the use of video-tagging makes the tagged game situations directly available as input for

DI, and students can bring them into the discussion. Student-controlled video-tagging may therefore not only benefit self-regulatory processes and motivational beliefs (Koekoek and Knoppers 2015; Van Maarseveen, Oudejans, and Savelsbergh 2018), but potentially also affects the mutual agreement and accuracy of students' perception of what actions a game situation affords.

The central aim of the current study is to explore how mutual agreement and accuracy of students' perceptions of tactical aspects of a basketball game situation and students' perceived learning outcomes are influenced by using a debate of ideas (DI) setting that is enriched with video footage from digital tagging. Across three lessons, this study gauges the constructions of two groups of students involved in debate of ideas (DI) settings that were either enriched with self-selected video footage or entirely based on students' verbal input. The mutual agreement and accuracy of these 'real-time' perceptions before and following the DI were compared between the two groups across the three lessons. To this end, during game play in each group three students (i.e. observers) used video-tagging to identify shots on basket and to judge the appropriateness of the decision to shoot. Additionally, after each lesson, the students were interviewed to assess their perceived learning outcomes. It was expected that video would promote situational perspectives about shot on basket situations (i.e. by stimulating dialogue, negotiation and critical thinking, students may learn to value others' perspectives). Accordingly, it was hypothesized that DI enriched with student-controlled video footage would increase the mutual agreement as well as the accuracy of students' perceptions of shot on basket situations. In addition, it was hypothesized that the perceived learning outcomes of shot on basket situations would be more similar for video enriched DI, reflecting a larger shared understanding among students.

Methodology

Participants and context

Twenty students (10 boys, 10 girls), aged between 11 and 13 years, volunteered to participate. These students were randomly chosen from two year one classes at a secondary school located in a medium sized city in the Netherlands. The two groups were not matched for motor skill or otherwise. In the Dutch school curriculum, PE is compulsory. In the participating school, students have three PE lessons each week, and PE-teachers design the lessons from a social constructivist learning perspective, in which they emphasize group work, collaboration and communication. The study was conducted in accordance with the ethical guidelines of National Organization of Dutch Universities of Applied Sciences (Netherlands Code of Conduct for Research Integrity 2018). The director and PE-teachers provided written informed consent for the study prior to recruiting student participants. Next and prior to the study, written informed consent was obtained from the parents, while students gave verbal informed consent.

An important aim for the present study was to achieve a high degree of representativeness. This means that the study design followed as closely as possible the normal proceedings of PE lessons, with one important exception: the roles students took (i.e. player, video-tagger, observer) were kept the same across games. This allowed us to collect both quantitative and qualitative data. Such a mixed method approach provides the opportunity to make layered interpretations (Anguera, Camerino, and Marta 2012; Onwuegbuzie and Leech 2004). In this respect, however, it is pertinent to acknowledge that the study is exploratory as the use of qualitative data constrained the sample size (i.e. the number of student observers that could be used for the quantitative analyses).

Material and equipment

The study took place on one half of a basketball court (10 × 14 m) in the school's regular PE-hall. The basket ring height was adjusted to 2.60 m. A video recorder (Sony, HDR CX115) placed on a tripod at the center of the court was used to record the games. In total, four iPads (i.e. 4th generation) were

used. One of these iPads was used by one student (i.e. the student video-tagger) to record and select video clips for reviewing during debate of ideas. To this end, *Videotagger* (Robinson 2014) was installed on the iPad. *Videotagger* was used for tagging and recording shots on basket. After tagging, it processes the tagged event into a video clip. *Apple TV* (version 3) connected with the same iPad and a WIFI-connection in the PE-hall permitted presentation of the video clips on a large monitor (Samsung, 32 inch) during DI. The other three iPads were used by three student-observers to identify shots on basket and evaluate their appropriateness. To this end, they used a tag panel on an iPad developed with the *Dartfish Easytag* application (Dartfish 2010). *Dartfish Easytag* enables the construction of a tag panel with buttons that represent predefined events in a match. It has been shown previously that the tag panel is a reliable tool when the provided events are sufficiently distinctive, and – if included- subsequent judgments or evaluations are binary (Koekoek et al. 2018). For the current study, the panel permitted tagging a shot on basket, followed -if a shot was identified- by a judgement whether or not the shot was appropriate. Each identification and judgment were time-stamped. The student video-tagger stood and the three student observers were seated behind the line during the game (Figure 1).

Design, procedure and data collection

Figure 2 shows the time line of the study procedures and data collection. The study was conducted in two groups from two classes, which consisted of ten students each. The two groups participated in a small sided 3 versus 2 basketball game across three subsequent PE-lessons (Koekoek, Dokman, and Walinga 2014). The participants had little to no experience with basketball in small-sided game situations. Yet, they all had previously received three lessons which addressed acquisition of basic basketball skills, such as shooting on the basket, passing and dribbling. The participants also had no previous experience in using video-tagging. The remaining students of the class participated in small sided PE activities on the other half of the PE hall.

The learning objective was for students to recognize and make appropriate decisions with respect to shooting on the basket. In line with a social constructivist learning perspective, students were not instructed about the situations that did or did not afford shooting. They together had to construct this meaning during the lessons. For each lesson, the same procedures for instructions and measurements were followed. The two experienced teacher-researchers (JK and WW) gave instructions to the students regarding the purpose and rules of the small-sided game, the different roles (i.e. player, video-tagging and observer) and the DI. The teacher-researchers assigned student roles and moderated the discussions during the DI.

The two groups differed in the manner in which the DI was facilitated. In each of three PE-lessons, two games were played. The DI took place immediately after the first game. In the video-group, the DI was enriched with video recordings of the game (see also Harvey and Gittins 2014), while in

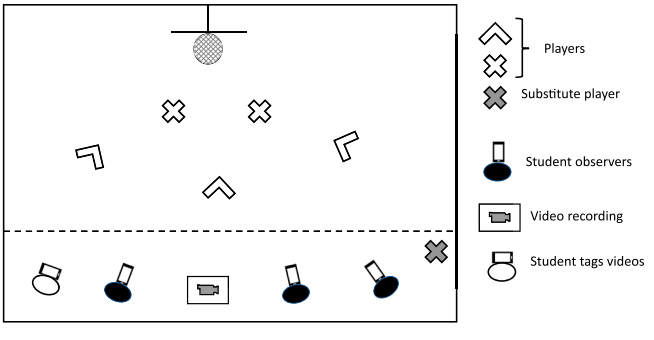

Figure 1. Set up for the Video DI Group.

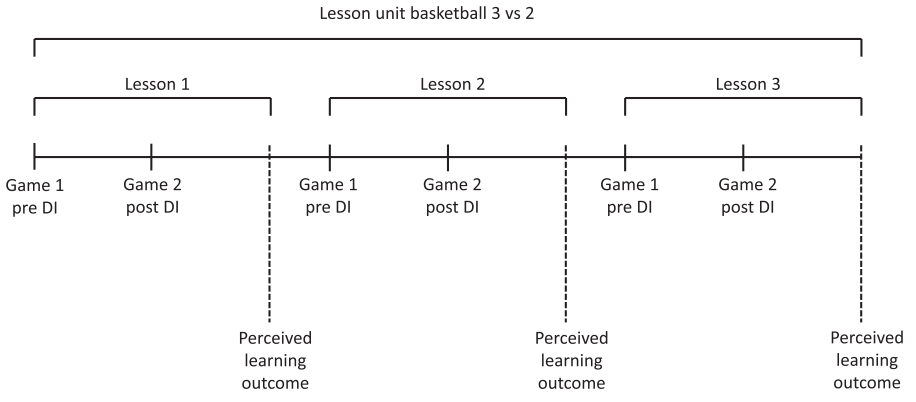

Figure 2. Time line of study procedures and the data collection events.

the verbal-group, the DI was entirely verbal. The DIs functioned (and were moderated) to stimulate debate around making decisions regarding the appropriateness of a shot on basket (e.g. relative to the distance on the basket or the degree of defense), collaboration between team mates, and more generally, to enhance students' understanding of team tactics and strategies (Koekoek, Walinga, and van Hilvoorde 2017). In the video-group one student was assigned the role of video-tagging and selecting tagged game situations for reviewing and discussing in the DI. After each 5-minute-game, the student video-tagger selected video clips, which were presented on the monitor as input for the DI session. The DI in the video-group involved a series of didactical procedures and questions (see Table 1). The verbal-group followed an identical procedure as the video-group, but without input of video footage. Because there was no student video-tagger in this verbal-group, two of the students served as a substitute player (rather than one as in the video group).

To explore the agreement and accuracy of students' perceptions, three students of both the video- and verbal-group were randomly assigned to the role of observer. The student-observers were instructed to observe the game play and tag each shot on the basket and judge whether the decision to shoot was appropriate or inappropriate using the *Dartfish* tag panel on the iPad. No further explication of appropriateness was given. The three student-observers of both groups only tagged: they neither participated in the game, nor were their tags used in the DI. However, these student-observers did participate in the DIs.

Table 1. Didactical procedure and example questions of the debates sessions for the video group.

Steps	Didactical procedure	Examples of questions for the teacher/researcher
1	During the game: The student-video tagger uses 'Videotagger' and judges tactical events during a game.	'When observing the first game, please make a judgement of all the shots on the basket you see and press the button if each shot on the basket is (1) appropriate or (2) inappropriate made by the player'
2	After the first game of 5 min play: The teacher asks the student video tagger to explain the tagged video clips.	'Can you explain one of your tagged video clips, especially why you think it is an appropriate or inappropriate chosen shot?'
3	Both the players and student observers are watching together several video clips on the video screen.	'We are going to watch the inappropriate chosen shots according to the judgement of the student video-tagger'
4	DI: Both players and student observers exchange ideas and interpret the video clips content. They are allowed to react to the student video tagger's choices.	'Can you explain what you think about the shot on the basket, and please try to formulate a reason that underpins your opinion?'
5	After the DI session the teacher makes some concluding remarks and formulates a learning question for the group.	'Do I draw the right conclusion if I say that it is important to shoot on the basket when you are in a position in the field with a big chance to score?'
6	Starting the second game of 5 min play	

Finally, at the end of each lesson all students were individually interviewed by one of the teacher-researchers and asked what they thought they had learned regarding shooting on the basket from playing the small-sided games and participating in the DI session, respectively. In lesson 1 and 2, the students did this in response to a single question: 'What can you tell about the difference between an appropriate and inappropriate shot on the basket?' At the end of lesson 3, students were asked: 'What did you learn in tactical terms about the shot on the basket?'

Data analysis

First, to assess the agreement between students' perceptions, the output of the tag panels for the three student-observers of both groups were event (and time) synchronized. Next, for each of three pairs of student-observers the number of agreement and disagreements were calculated (i.e. students 1 and 2, students 1 and 3, and students 2 and 3). An agreement was defined as both observers identifying the shot *and* both judging it as either appropriate or inappropriate. A disagreement was defined as only one of two observers identifying the shot *and/or* one observer judging the shot as appropriate and the other as inappropriate. Finally, a series of Chi-square analyses was performed to examine whether the distribution of the total number of agreements and disagreements (i.e. the sum for the three pairs of student-observers of one group) differed between groups, games and across lessons.

Second, the accuracy of the students' perception was assessed. To this end, first the recordings of the games (made by the video camera on the tripod) were watched offline and scored by an expert game teacher. The expert identified all (attempted) shots on basket and evaluated whether or not these shots were appropriate. For this purpose, 'appropriate' was defined relative to the distance to basket the ball was shot, the presence of a team mate who was better positioned to shoot, and the presence of an opponent, who could defend or interfere the shots on the basket. Next and similar to the agreement analysis, the number of agreements and disagreements between each student-observer of the two groups and the expert teacher were determined, followed by a series of Chi-square analyses to examine whether the distribution of the total number of agreements and disagreements (i.e. the sum for the three pairs of student-observers in one group) differed between groups, games and across lessons.

Third, the students' answers regarding the question on perceived learning outcome were transcribed. These answers were categorized into emergent themes for each of the ten players of both groups over three lessons with the use of a constant comparative analysis (Charmaz 2006). Subsequently, the consistency of the responses among students, and the sort of outcome (i.e. how answers changed over sessions) between students and between sessions were analyzed.

Results

Agreement of students' perceptions

Figure 3 shows the total number of agreements and disagreements among the three student-observer pairs for the video-group and the verbal-group across the three lessons. The percentage of agreements for the separate games ranged between 42% and 75% with an average accuracy of 58% for the video group and 63% for the verbal group. Overall, the agreements in identifying shots on basket *and* judging whether the shot was appropriate or not were relatively low in both groups. There were also no significant changes within and across lessons. This was confirmed with a series of X^2-analyses assessing a change in the distribution of the number of agreements and disagreements within and between lessons for each group (X^2's < 2.9, p's $> .09$). However, one exception was revealed: in the first lesson of the verbal DI guided group, the number of agreements significantly increased after the DI ($X^2(1) = 6.04$, $p = 0.014$, see Figure 3, bottom row, left panel). Finally, also a series of X^2-analyses assessing distribution of the number of agreements and disagreements in each game between the two groups did not reveal significant differences (X^2's < 1.63, p's > 0.20).

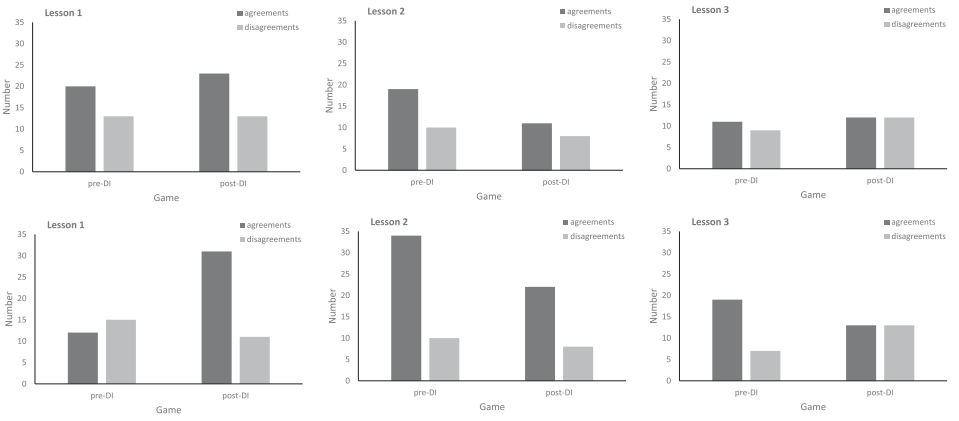

Figure 3. Agreement of students' perceptions. The total number of agreements and disagreements between students pre- and post-di as function of lesson for video group (top row) and verbal group (bottom row).

Accuracy of students' judgements

Figure 4 presents the accuracy of the student-observers' judgments. Accuracy was measured as the total number of agreements and disagreements between the expert game teacher researcher and the student-observers. The percentage of agreements for the separate games ranged between 53% and 76% with an average accuracy of 65% for the video group and 66% for the verbal group. There were also no apparent changes in accuracy. For both groups, there were no significant changes in distribution between pre-DI to post-DI (X^2's < 1.2, p's > .26) and between lessons (X^2's < 4.4, p's > .11). Finally, also the distribution of the number of agreements and disagreements in each game between the two groups did not reveal significant differences (X^2's < 1.53, p's > .23).

Students' perceived learning outcome

The students in both the video-group and the verbal-group responded individually on the question what they can tell about the difference between an appropriate and inappropriate shot (i.e. lesson 1 and 2) and what they did learn regarding the tactical aspects of shooting on the basket (lesson 3).

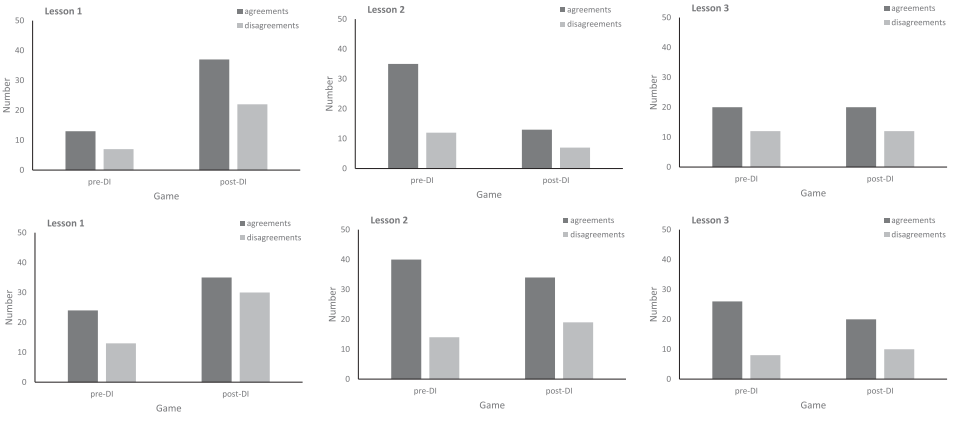

Figure 4. Accuracy of students' judgements. The total number of agreements and disagreements between expert and students pre- and post-DI as function of lesson for video group (top row) and verbal group (bottom row).

Appendix 1 presents example responses of both groups. As can be seen many of the responses refer to specific elements of game play, such as tactical decisions, positions on court, position of opponents, and position of teammates. In general, the students provided straightforward answers. They typically used one full sentence to express their thoughts regarding shooting at the basket. Some students expressed their thoughts with only one or two words.

The responses of the students showed a clear difference between both groups in what they perceived as the critical aspect for defining a shot as appropriate. Notably, the verbal-group showed a larger variety in their responses after each lesson while students' answers in the video-group showed more consistency. Many students in the verbal-group also reported more (than one) tactical aspects as learning outcomes after lesson 3. Finally, a few students responded that they had not only learned about when a shot on basket is appropriate, but that they also had acquired other aspects related to basketball, such as the technical performance of shooting, even though this was not introduced in the DI by the teacher-researchers. In both groups, the learning objective 'shooting at the basket' was often reproduced in the students' answers, which they linked to different tactical aspects. Four themes emerged in the students' responses: 'free or undefended shot on target,' 'distance to target,' 'focus of attention,' and 'teammates' actions.'

The answers of students in the video-group were mainly related to the theme 'free or undefended shot on target.' They considered that a free shot would include several preconditions such as shooting without being defended too closely and looking for teammates who are in a better position. For example, one student answered: 'An appropriate shot on the basket is when there are no players standing around me,' while a second student explained: '[A shot on basket that is not appropriate] is when you shoot while there are too many defenders. You have to be in a free position.' These preconditions were particularly manifest in the responses after the first and second lesson. Almost all students in the video-group defined this as the central learning outcome after the third lesson. One student responded in a way that allowed no alternatives: 'I only shoot on the basket when I am in a free position.' Another student also considered the future outcomes: 'I learned to shoot on the basket when nobody from the other team is standing near the basket.' This student did include the situation which may occur after a shot missed the basket. In this answer a free shot on the basket also means that there would be time for a second attempt.

In the verbal-group, students particularly answered in terms that are related to the theme 'distance to target.' For example, one student explained: '[It is not appropriate to shoot] when you aim on the basket too far from the basket.' In fact, many students estimated the appropriate distance from the basket as a distance that was within their capability of throwing. For example, one student responded: 'It is better to avoid shooting at the basket [from a position] that is too far.' Another student in the verbal-group explained after the first lesson what she thought an inappropriate shot on the basket means: '[inappropriate] is when [the shot] is too far from the basket or too close. The shot should be on a distance that is reasonable. Actually, I know in that case that I can reach the basket [boarding].' After the third lesson she explained that the distance to the basket was still important, but in her judgement about shooting at the basket she also considered her own capabilities: '[I will shoot on the basket] when I think I can reach the basket.'

In both groups, the students also articulated other aspects in their judgement of shooting distance such as the throwing technique and their ability to create space. These aspects were related to the themes 'focus of attention' and 'team mates' actions.' Especially, in the video-group, several students responded that it is important to watch and pay direct attention to what occurs in the game in deciding whether or not to shoot. For example, one student answered after the second lesson: '[I will shoot on the basket] when there are not many other children around me,' suggesting that this student's decision to shoot at the basket did consider the presence of other students, but irrespective of whether they were opponents or teammates. After the third lesson she gave an answer that suggested she had shifted her focus somewhat: 'It is important to watch where I can have a better position in the field, and look after [the position of both] defenders and teammates.' Students also responded with technical issues when judging the shot on basket. For example: 'a good shot is often successful when you use two hands.'

Discussion

The central purpose of this study was to explore how mutual agreement and accuracy of students' perceptions of tactical aspects of a basketball game situation and students' perceived learning outcomes are influenced by using a debate of ideas (DI) setting that is enriched with video footage from digital tagging. The results of this study showed that the degree of agreement and accuracy among student-observers varied considerably in identifying and judging tactical situations in basketball. Yet, there were neither systematic nor significant changes across lessons or between groups. The students' perceived learning outcomes in the video guided group were more consistent and showed a greater emphasis on contextual aspects (e.g. teammates and opponents) in making decisions regarding the appropriateness of a shot on the basket.

The present findings thus indicate that a DI setting does not necessarily imply that observers develop a stronger agreement on what they perceive and how they judge this. This was also true when the DI was enriched with video-footage. Possibly, the classmates might have brought up a large diversity of tactical solutions in the group discussions, revealing an increasing number of possible decision making options for the individual student. Interestingly, although agreements did not differ between the two groups, the differences in perceived learning outcomes do suggest that tactical discussions enriched with video may have promoted diversity in the groups' perspectives of the tactical options available -or at least a difference in the options that were considered most relevant. Namely, the video guided debates seem to stimulate students to focus on 'free or undefended shot on target,' while the verbal group more often articulated tactical aspects with respect to 'distance to target.' Although these differences in learning outcomes can also be attributed to factors other than the use of digital video, it does suggest that using digital tools is not simply neutral. When incorporating digital tools it is also required to consider students' perceptual and cognitive backgrounds (O'Donoghue 2016; Walinga, Koekoek, and van Hilvoorde 2017). In this respect, students should be enabled to practice using the tag panel and provide them sufficient time to learn what is, in fact, a dual task involving both observing and tagging.

Also, with respect to the student-observers' accuracy in identifying and judging shootings at the basket, there was not a simple line of progression following a DI or across lessons. In other words, the DIs did not improve the accuracy of students tactical understanding, also not when it was enriched with video-footage. Again, it cannot be ruled out that a DI, irrespective of whether or not it is streamlined with video, generates a larger variety of tactical options, rather than narrowing down the options to one single correct solution. Here, an important issue for consideration -also for research- is when to introduce a DI within or across a lesson. For example, dealing with different interpretations and a variety of tactical options may have different effects and benefits for students' learning, depending on whether they are beginner learners or whether they are more competent learners that tend to re-enact a preferred solution (Walinga et al. 2018).

Nevertheless, it is important to emphasize that the students' perceived learning outcomes were in line with the central purpose of a game based approach such as TGfU (Harvey and Jarrett 2014). Namely, these students' perceptions included processes of decision making that are learner centered. This is pertinent, because the teachers did not explicitly guide them toward these outcomes. These findings are in line with the aims of a social constructivist situated learning perspective, in which learning arises from the circumstances in a particular time and place, rather than being prescribed by a teacher only (Kirk and Macdonald 1998; Wallian and Chang 2007). This was especially present in students' primarily focus on team tactics rather than only on individual's techniques or capabilities. This underlines that game-based approaches with DI promote relational and communication skills and *shared* understandings to judge about tactical situations (Ronglan and Ertesvåg 2015). In this respect, it is pertinent that the perceived learning outcome of students who watched video footage selected by an observer showed more consistency across students and lessons than in the verbal guided group. That is, many students in the video guided group articulated similar tactical intentions (especially, 'free or undefended shot on target'), while the students in the verbal guided

group tended to show a greater variety in their answers. This finding suggests that enriching DI with video footage enhanced the shared understanding of a complex tactical situation, and likely increased focus towards the position of teammates and opponents. In contrast, the topic 'distance to the basket,' that was discussed by the verbal DI group, suggests that these students much more limited their explanations to their individual capability. Thus, these students may have relied more on personal views and capacities in order to review tactical choices and positions in the field, while the context (i.e. the role of team mates and opponents) received less attention. Discussions in debates without the use of videos could therefore limit the situatedness of tactical options that students develop. A student-controlled video debate may create more degrees of freedom to develop contextual interpretations.

The particular contextual interpretations of students' perceptions in the video guided debates can be a pitfall for teachers. The different perceptions and understandings that students bring into the discussion may -seemingly- interfere with the teacher's learning objective. Therefore, a decisive role is assigned to the teacher's pedagogical skills when introducing video guided debates. Indeed, Palao et al. (2015) stressed that effective, interactive video guidance require complex teaching skills. For example, teachers must observe tactical events in the game and determine the frequency and timing of DI. At the same time, teachers must moderate the contribution of different students into the discussions. Hence, a pertinent first step in future research on student-centered video-guided DI is to investigate the teacher skills needed to manage and optimize the pedagogical conditions of DI. Therefore it would be valuable to explore how the different teaching skills required for an optimal video guided debates setting may foster or perhaps obstruct student learning processes. Such insights may contribute to new knowledge and understanding regarding the incorporation of digital observation tools in game based pedagogies (Memmert et al. 2015).

This discussion can be concluded with a reflection on how the current insights may contribute to the development of innovative digital pedagogies. In the present study, the digital tagging applications fostered the game teaching practice. In other words, the digital observation tool in this study was not merely used as a research instrument, but it was integrated in teaching in order to collect the data in this study. This method provided the opportunity to explore new procedures and teaching methodologies to support students in self-regulating their learning processes. To achieve this end, the researchers have been endeavored to organize this study in a representative physical education setting. Yet, this research is not without limitations. Since the study involved only a subgroup of students within one class, the PE teachers could not be fully involved; they were teaching the remaining students. In particular, some may stress the importance of PE teachers to guide the DIs, because they are more aware of the social context and their students' concerns and needs (e.g. preferences for working with peers, work attitudes in groups, friendships, see Koekoek and Knoppers 2015). This knowledge may increase productivity of social interactions during DI. In this respect, PE teachers can benefit even more from the findings in this study if they intend to use an action research approach in which they learn themselves to collect data, to handle the technology, and to understand the pedagogical didactical procedures and requirements (e.g. Keegan 2016).

Another limitation of this study is the extent to which these results can be generalized to other contexts. The PE classroom situation is often dynamic and unique. Even one basketball game may differ because the students' motivations change, their tactical and technical backgrounds differ, and so on. This variability can influence the dynamics of the social interactions during DI. Although this study did try to ensure some standardization across lessons by keeping the students in the same roles, it did strive to maintain representativeness with respect to the PE context. Consequently, the data was not collected with the purpose to determine whether video guided DI would work in different contexts. In addition, the high and intensive collaboration that was needed between researchers, teachers and students during the sessions, considerably constrained the sample size. Hence, the present observations need further corroboration. This been said, the mixed methods did put the students' observations and perceived learning outcomes into perspective. For instance,

although students from the video guided DI group showed more consistency in perceptions of what they tactically learned, the findings in this study did not indicate that video guided debates achieve higher agreements and accurate judgements. These perhaps paradoxical observations warrant further investigation. In our opinion, in future research a more detailed qualitative assessment of the dynamics of the discussions between students during DI with video guidance could be of more interest for PE teachers than replicating this study with a larger sample size -although this is not without interest either.

Conclusion

The debate of ideas in a pedagogical game-setting generated a variety of meanings about tactical situations among students, irrespective of the debate being enriched by digital video. That is, students' agreement and accuracy of their perception of tactical situation was not differently influenced by DIs that were video or verbally guided. However, the student-centered debates supplemented with video did enhance the consistency of students' shared understanding of tactical learning objectives of games compared to verbal guided DI.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1. Examples of students' answers of the single question after each basketball lesson (video and verbal group).

Student	Sex	Lesson 1 What can you tell about the difference between an appropriate or an inappropriate chosen shot on the basket?	Lesson 2 Same question as after lesson 1	Lesson 3 What did you tactically learned about the shot on the basket?
1.	F	An appropriately chosen shot is when you are in a free position and passing the ball well together An inappropriately chosen shot is when you play the ball only by yourself	An inappropriately chosen shot is when you shoot too often without having a free position	Only shoot on the basket when I am in a free position
2.	M	I have no idea	An appropriately chosen is when I have a free position with enough space to shoot on the basket	Only shoot on the basket when I am in a free position
3.	F	An appropriately chosen shot does have many chances on success and a poor shot doesn't An inappropriately chosen shot is from a distance that is too far or too close	An appropriately chosen shot is from the right distance to the basket	Not too far from the basket If someone stays in front of you: don't shoot!
4.	M	An appropriately chosen shot is if you wait not too long with shooting on the basket	When you aim on the basket too far from the basket it is inappropriately chosen	Watching If you can shoot then shoot! Not too far or too close from the basket